ABSTRACT OF THE DISCLOSURE

A planar MRI system is disclosed. The system has an open magnet configuration that produces a magnetic field having a remote region of substantial magnetic field homogeneity. Spatial encoding gradient coils and a rf coil provide MRI data for image reconstruction. A first magnet system having a first ferromagnetic core and a first longitudinal axis with a first pair of coils around the first ferromagnetic core and spaced apart along the first longitudinal axis is located orthogonal to and in substantially the same plane as a second magnet system having a second ferromagnetic core and a second longitudinal axis with a second pair of coils around the second ferromagnetic core and spaced apart along the second longitudinal axis. The open magnet configuration preferably has a ferromagnetic core with a substantially planar core surface layer and a longitudinal axis, and a unipolar current wire pair on a side of the ferromagnetic core adjacent the planar core surface layer. The wire pair is separated along the longitudinal axis and extends in a direction substantially perpendicular to the axis and substantially parallel to the planar core surface layer. The current wire pair provides a magnetic field having a maximum between the current wire pair along a direction perpendicular to the planar core surface layer and in the remote region of substantial magnetic field homogeneity. The planar core surface layer of the ferromagnetic core provides an orthogonal refractory effect in the form of mirror imaging current wires having the same polarity as the current wire pair that substantially increases the resulting magnetic field compared to a magnetic field generated by the current wire pair in free space.